(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number : **0 396 367 B1**

(12) # EUROPEAN PATENT SPECIFICATION

(45) Date of publication of patent specification : **20.01.93 Bulletin 93/03**

(51) Int. Cl.^{5} : **F16L 19/08**, F16L 15/00

(21) Application number : **90304676.1**

(22) Date of filing : **30.04.90**

(54) **Water faucet inlet line connector.**

(30) Priority : **03.05.89 US 347106**

(43) Date of publication of application : **07.11.90 Bulletin 90/45**

(45) Publication of the grant of the patent : **20.01.93 Bulletin 93/03**

(84) Designated Contracting States : **DE FR GB IT**

(56) References cited :
FR-A- 2 338 446
US-A- 3 893 716
US-A- 4 655 486
US-A- 4 826 218

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Description

This invention relates to a connector used to join the shank of a water faucet to a water supply line or tube, in particular to a connector having improved sealing characteristics while concomitantly reducing the force required to insert the water supply tube into the connector.

In United States Patent 4,655,486, a connector for joining a shank of a water faucet to a water supply line or tube is disclosed. This known connector comprises two body members having a conical or belleville type spring entrapped therebetween. While the known connector provides a quick and reliable connecting means, it does suffer from certain deficiencies.

For example, the known connector requires a relatively large force to push the tube through the retention device of the connector to overcome the frictional resistance of the retention device.

Further, in the known connector design, the grabbing or retention force between the retention element thereof and the tube is determined by the initial diametric interference therebetween. Accordingly, regardless of the tubing material, the retention force exerted by the retention element on the tube is the same. In instances where the tubing material is hard, such as chrome plated tube, the retention force developed by the fixed interference between the tube and the retention element may not be adequate to bite into the hard surface of the tube, resulting in possible slippage and failure of the tube/faucet connection.

A still further disadvantage with the prior art connector relates to the use of the formation of a thermoplastic bead on the inside surface of one of the body members to form a seal between the outside surface of the tube and the inside surface of the connector. Due to manufacturing tolerances, the integrally formed thermoplastic bead seal is not always as reliable as might be desired.

As noted previously, the retention force between the connector and tubing is developed by diametric interference between the retention element and tube. As a result of such diametric interference, score marks are produced on the tube surface as the tube is inserted through the retention element. In some instances, the score marks function as by-pass channels about the seal of the connector, which results in undesirable leakage.

Finally, in the known design, once the tube is inserted into the connector, the tube cannot be retracted. Due to the diametric interference between the retention element and the tube, any attempted retraction of the tube would generally result in damage to either the tube or connector.

The disadvantages discussed above are reduced or substantially obviated in the connector of the present design. The present connector no longer relies upon diametric interference between the retention device and tube to develop the retention force. In the present device initial diametric interference between the retention element and tube is eliminated and the retention force is developed after the tube is inserted into the connector. Further, in the connector of the present invention, the magnitude of the grabbing or retention force can be varied so that the force is adequate to prevent relative movement of the tube and connector regardless of the tubing material.

Since the force developed by the diametric interference of the tubing and connector has been eliminated in the present connector, and the retention force is developed after the tubing is inserted into the connector, the force may subsequently by eliminated and the tubing readily removed after insertion. Further, since the diametric interference between the tube and connector has been eliminated, scoring of the tube is similarly no longer a problem.

Finally, the present connector utilizes a standard elastomer O-ring to improve sealing reliability. The use of a standard elastomer O-ring avoids the necessity of utilizing an integral thermoplastic bead on the inside surface of one of the body members forming the connector.

Accordingly, it is an object of the present invention to provide a connector for joining the flange of a water faucet to a water supply line which connector has improved sealing characteristics and whereby the retention force for maintaining the water supply line within the connector is generated after the supply line is inserted into the connector.

The invention provides an inlet water line connector structured for connecting an inlet water line having a predetermined outer diameter to the end of a water faucet shank having external threads on the outer cylindrical surface and a tapered internal inlet region larger in diameter than the predetermined outer diameter of the inlet water line, in which the structure of the connector comprises

a first body member;

a second body member in assembly with the first body member to form a compressible body;

the body having first and second ends and an opening therethrough into which first end an inlet water line of the predetermined outer diameter may be inserted, the body having an outer tapered surface for fitting within and engaging the tapered internal inlet region of the faucet shank the body also having a shoulder in the form of an outward directed flange formed on the body between the outer tapered surface and the first end thereof;

a unitary spring member within the body having a plurality of integral spring elements projecting inward and angled toward the second end of the body the spring elements in a free state collectively defining an inner periphery thereof of a diameter greater than the predetermined outer diameter of the inlet wa-

ter line, the spring elements being elastically deflectable but remaining in a free state as the inlet water line is inserted through the body;

a retainer ring within the body positioned between the spring elements and the second end and normally in spaced relation to the spring elements; and

force generating means for applying an initial force against the outward directed flange of the body and thereby compressing the body members together, and the first member into the internal inlet region of the faucet shank, with a forced fit between the outer tapered surface of the body and tapered internal region of the faucet shank limiting axial movement of the body toward the faucet shank the force generating means, upon continued application of the force, comprising the retainer ring against the spring member and thereby deflecting the spring elements into forcible engagement with the outer surface of the inlet water line.

An embodiment of an inlet water line connector according to the invention will now be described with reference to the accompanying drawings, in which:

Figure 1 is a partial cross sectional view of a portion of a faucet installation illustrating a connector according to the present invention connecting an inlet water line to a water faucet shank;

Figure 2 is a sectional view of a known connector.

Figure 3 is an exploded view of a connector according to the present invention illustrating details thereof;

Figure 4 is a cross sectional view taken along the longitudinal axis of the connector illustrating the retention element thereof in a relaxed state;

Figure 5 is a view similar to Figure 4 illustrating the retention element thereof in a holding state; and

Figure 6 is a perspective sectional view of the connector according to the present invention.

Referring now to the drawing, there is disclosed in Figure 1 and 3 to 6 a preferred embodiment of the present invention. Figure 2 illustrates a known faucet connector such as that disclosed in US Patent No. 4,655,486. In referring to the several figures of the drawing like numerals shall refer to like parts.

Figure 1 illustrates a partial cross section of a typical sink faucet installation. Faucet assembly 10, a portion of which is shown, is mounted to a sink through a pair of mounting holes 12 (only one being show) with the threaded shank 13 of each of the hot and cold water faucet valves passing through a corresponding hole 12 in the sink and being retained with respect thereto by a locking ring or nut 16.

The present invention relates to a connector which may be utilized for coupling water inlet line or tube 11 to the lower end of threaded shank 13. The connector 25 is ultimately locked in place by a lock nut, such as plastic coupling nut 20 having wings 22 thereon which are used to make it possible for the coupling nut to be tightened manually as required.

The details of connector 25 are illustrated in particular in Figures 3 to 6. Connector 25 comprises an upper body member 26 and lower body member 28 with a retention element shown as a spring member 30, floating retainer ring 32 and O-ring 34 entrapped between the two body members. The spatial relation of upper and lower is relative to the normal installation orientation (as illustrated in Figure 1).

Upper body member 26 includes a tapered region 37 terminating at one end in a short cylindrical section 36 and at the other end in a bevelled annular flange 38. Upper body member 26 further includes a first generally cylindrical inner surface 40 and a second generally cylindrical surface 44, which latter surface is of a generally greater diameter than the former surface. The junction between inner surfaces 40 and 44 defines shoulder 42 therebetween. As illustrated in Figure 4, the diameter of inner surface 40 is sized so that the upper body member has a loose slip fit over the end of water inlet tube 11 when the tube is inserted into connector 25.

Lower body member 28 comprises a pair of cylindrical sections 46 and 52, with the latter section having a generally smaller diameter than the former section. Inner surface 48 of larger cylindrical section 46 is substantially the same diametrical size as bevelled annular flange 38 of upper body member 26. As illustrated particularly in Figures 4 and 5, the upper end of cylindrical section 46 includes a bevelled annular flange 50 which, when connector 25 is assembled, mates with bevelled annular flange 38 of upper body member 26. As illustrated in Figure 4 the relatively small diameter of inner surface 53 of section 52 of lower body member 46 is sized for a loose fit over the outer surface of water inlet line 11.

Four button shaped projections 54 are moulded on the outer surface of cylindrical section 52. The button shaped projections are spaced from each other at approximately 90 degree intervals about the circumference of the outer surface of cylindrical section 52.

Floating ring 32 includes an inner wall 56 which as illustrated in Figure 4 is in normally spaced relation to the outer surface of the tube 11. The outer surface of ring 32 is defined by bevelled sections 60 and 62.

Spring member 30 is generally conically shaped and is preferably a Belleville spring. The inner diameter of member 30 is defined collectively by the inner ends of the various spring elements 66. As illustrated in Figure 4, the inner diameter of the spring is sized to provide a slip fit with respect to the outer surface of inlet tube 11.

Body members 26 and 28 may be joined to each other in substantially any manner desired and in fact need not be joined with any special integrity as they are forcibly held together when in use. In the preferred embodiment, upper body member 26 and lower body

member 28 are designed to snap together by utilization of bevelled flange 38 of body member 26 in cooperation with bevelled flange 50 of lower body member 28. The foregoing described snap fit relationship between the upper and lower body members enables the body members to slide axially relative to each other to compress the entrapped spring member 30, floating ring 32, and O-ring 34. Floating retainer ring 32 and shoulder 42 formed on the inside surface of upper body member 26 cooperate to form the gland for O-ring 34.

Referring specifically to Figures 4 and 5, the use of the connector assembly of the present invention will now be explained with respect to connecting water inlet tube 11 to shank 13 of faucet 10. Initially, connector 25 is first slipped over the end of inlet line 11 until the end 19 of the inlet line abuts stop shoulder 68 formed at the upper end of body member 26. Once the connector is properly positioned on the end of the inlet line, coupling nut 20 is placed therearound so that shoulder 74 of the coupling nut engages shoulder 76 of body member 28. Likewise, button shaped projections 54 engage a radially inwardly extending shoulder 78 formed on the inner surface of the coupling nut.

The short cylindrical section 36 of upper body member 26 is inserted into the lower tapered end 15 of shank 13. Thereafter, coupling nut 20 is threaded onto the threaded outer surface of shank 13.

To complete the connection of inlet water line 11 to shank 13, coupling nut 20 is tightened. Due to the threaded engagement between the shank and coupling nut, tightening of the nut results in the nut and lower body member being moved axially upward relative to upper body member 26. The foregoing axial movement in turn compresses entrapped spring element 30, floating retainer ring 32 and O-ring 34 against each other. As illustrated in Figure 5, when sufficient compression force is developed, the inner diameter 56 of retainer ring 32 will contact the inclined surface 63 of each spring element 66 to cause the spring elements to flex inwardly against the outer surface of inlet line 11. Such movement results in the inner edges 67 of each spring element 66 penetrating the outer wall of the inlet line 11. Similarly, compression of O-ring 34 between retainer ring 32 and shoulder 42 results in the O-ring forming an efficient seal about the outer surface of the inlet line.

The known device as illustrated in Figure 2, requires diametric interference between spring washer 79 and the outer surface of inlet line 11. In the known connector, washer 79 is entrapped between upper 82 and lower 84 body members. The retention force developed by the known connector is in direct proportion to the diametric interference between the respective parts. In the present invention, the retention force may be varied by axially changing the position of coupling nut 20. Further the known connector has an inherent tendency to score the outer surface of inlet line 11 as the line was inserted and passed across the sharp metal edges of spring washer 79. The score marks formed minute bypass paths about seal 80 which effectively reduced the reliability of the seal.

As mentioned previously, in the present invention, the inner surfaces 40, 56, 66, and 53 are normally spaced from the outer surface of water inlet tube 11 to provide a slip fit therebetween. This results in a significant reduction in the force required to insert the tube within the connector, which not only aids in the installation of the inlet tube by enabling the installer to feel when the end 19 of the inlet tube is abutting shoulder 68 of the upper member 26, but in addition enables the installer to insert line 11 fully within the connector and remove the line any number of times prior to tightening coupling nut 20. Further, since spring 30 returns to its relaxed position when the tightening force on coupling nut 20 is eliminated, line 11 can be conveniently removed from the connector.

In the known connector as illustrated in Figure 2, once the inlet tube was inserted within the connector, the tube could not be removed therefrom since the spring washer of the known design essentially permitted only one way movement of the tube relative thereto.

As has been previously discussed, the retention force developed by the connector on inlet line 11 is directly related to the torsional force developed through tightening nut 20. If the material forming inlet 11 is relatively hard, then nut 20 may be tightened a greater amount than if the material forming the inlet line were relatively soft, as for example a plastic material. In effect, the coupling nut can be tightened until the ends of spring elements 66 penetrate the surface of the inlet tube.

Claims

1. An inlet water line connector (25) structured for connecting an inlet water line (11) having a predetermined outer diameter to the end of a water faucet shank (13) having external threads (14) on the outer cylindrical surface and a tapered internal inlet region (15) larger in diameter than the predetermined outer diameter of the inlet water line (11), in which the structure of the connector comprises

   a first body member (26);

   a second body member (28) in assembly with the first body member (26) to form a compressible body (26,28);

   the body (26, 28) having first and second ends and an opening therethrough into which first end an inlet water line (11) of the predetermined outer diameter may be inserted, the body (26, 28) having an outer tapered surface (37) for fitting within and engaging the tapered internal inlet re-

gion (15) of the faucet shank (13) the body (26, 28) also having a shoulder in the form of an outward directed flange (38) formed on the body (26, 28) between the outer tapered surface (37) and the first end thereof;

a unitary spring member (30) within the body (26, 28) having a plurality of integral spring elements (66) projecting inward and angled toward the second end of the body (26, 28) the spring elements (66) in a free state collectively defining an inner periphery thereof of a diameter greater than the predetermined outer diameter of the inlet water line (11), the spring elements (66) being elastically deflectable but remaining in a free state as the inlet water line (11) is inserted through the body (26, 28);

a retainer ring (32) within the body (26, 28) positioned between the spring elements (66) and the second end and normally in spaced relation to the spring elements (66); and

force generating means (20, 28) for applying an initial axial force against the outward directed flange (38) of the body (26, 28) and thereby compressing the body members together, and the first member (26) into the internal inlet region (15) of the faucet shank (13), with a forced fit between the outer tapered surface (37) of the body (26, 28) and tapered internal region (15) of the faucet shank (13) limiting axial movement of the body (26, 28) toward the faucet shank (13), the force generating means (20, 28), upon continued application of the force, compressing the retainer ring (32) against the spring member (30) and thereby deflecting the spring elements (66) into forcible engagement with the outer surface of the inlet water line (11).

2. An inlet water line connector (25) according to claim 1, characterised in that the body (26, 28) includes an inward directed shoulder (42) between the outward directed flange (38) and the outer tapered surface (37); and

an O-ring (34) within the body (26, 28) and disposed between the inward directed shoulder (42) and the first member (32), with the O-ring (34) being squeezed by the compressive forces as such forces are being transferred to the retainer ring (32) between opposed surfaces of the shoulder (42) and the retainer ring (32) as the body (26, 28) is compressed into the internal inlet region (15) of the faucet shank (13).

3. An inlet water line connector (25) according to claim 1 or claim 2, characterised in that the retainer ring (32) is generally ring shaped.

4. An inlet water line connector (25) according to any of claims 1 to 3, characterised in that the force generating means (20) is capable of varying the magnitude of the compressive force acting on said spring elements (66).

Patentansprüche

1. Einlaßwasserleitungsverbindungsstück (25), das aufgebaut ist zum Verbinden einer Einlaßwasserleitung (11), die einen vorbestimmten äußeren Durchmesser aufweist, mit dem Ende eines Wasserhahnschafts (13), der ein äußeres Gewinde (14) an der äußeren zylindrischen Oberfläche und einen kegelförmigen inneren Einlaßbereich (15), der im Durchmesser größer als der vorbestimmte äußere Durchmesser der Einlaßwasserleitung (11) ist, aufweist, wobei die Gestaltung des Verbindungsstücks umfaßt:
ein erstes Körperelement (26);
ein zweites Körperelement (28), zusammengebaut mit dem ersten Körperlement (26), um einen komprimierbaren Körper (26, 28) zu bilden;
wobei der Körper (26, 28) ein erstes und ein zweites Ende aufweist, und eine Öffnung dort hindurch, in dessen erstes Ende eine Einlaßwasserleitung (11) des vorbestimmten äußeren Durchmessers eingefügt werden kann, wobei der Körper (26, 28) eine äußere kegelförmige Oberfläche (37) aufweist zum Passen in und im Eingriff stehen mit dem kegelförmigen inneren Einlaßbereich (15) des Hahnschaftes (13) des Körpers (26, 28), der auch eine Schulter in der Form eines nach außen gerichteten Flansches (38) aufweist, der an dem Körper (26, 28) zwischen der äußeren kegelförmigen Oberfläche (37) und seinem ersten Ende ausgebildet ist;
ein einheitliches Federelement (30) in dem Körper (26, 28), das eine Vielzahl integraler Federelemente (66) aufweist, die nach innen und abgewinkelt gegen das zweite Ende des Körpers (26, 28) vorstehen, wobei die Federelemente (66) in einem freien Zustand gemeinsam einen inneren Umfang davon eines Durchmessers, der größer als der vorbestimmte äußere Durchmesser der Einlaßwasserleitung (11) ist, definieren, wobei die Federelemente (66) elastich biegsam sind, aber in einem freien Zustand bleiben, wenn die Einlaßwasserleitung (11) durch den Körper (26, 28) eingefügt ist; einen Rückhaltering (32) in dem Körper (26, 28), positioniert zwischen den Federlementen (66) und dem zweiten Ende und normalerweise in der Abstandsrelation zu den Federelementen (66); und eine Krafterzeugungseinrichtung (20, 28) zum Anlegen einer anfänglichen axialen Kraft entgegen den nach außen gerichteten Flansch (38) des Körpers (26, 28), um dadurch die Körperelemente zusammen und das erste Element (26) in dem Inneren Einlaßbereich

(15) des Hahnschaftes (13) zu drücken, wobei eine erzwungene Passung zwischen der äußeren kegelförmigen Oberfläche (37) des Körpers (26, 28) und dem kegeleförmigen inneren Bereich (15) des Hahnschaftes (13) eine axiale Bewegung des Körpers (26, 28) gegen den Hahnschaft (13) begrenzt, wobei die Krafterzeugungseinrichtung (20, 28) auf ein fortgesetztes Anlegen der Kraft hin den Rückhaltering (32) gegen das Federelement (30) drückt und dadurch die Federelemente (66) in einen Zwangseingriff mit der äußeren Oberfläche der Einlaßwasserleitung (11) biegt.

2. Einlaßwasserleitungsverbindungsstück (25) nach Anspruch 1, dadurch gekennzeichnet, daß der Körper (26, 28) eine nach innen gerichtete Schulter (42) zwischen dem nach außen gerichteten Flansch (38) und der äußeren kegelförmigen Oberfläche (37) enthält; und

einen O-Ring (34) in dem Körper (26, 28) und zwischen der nach innen gerichteten Schulter (42) und dem ersten Element (32) angeordnet, wobei der O-Ring (34) durch die Druckkräfte gedrückt wird, wenn solche Kräfte zu dem Rückhaltering (32) zwischen der entgegengesetzten Oberfläche der Schulter (42) und dem Rückhaltering (32) übertragen werden, wenn der Körper (26, 28) in den inneren Einlaßbereich (15) des Hahnschaftes (13) gedrückt wird.

3. Einlaßwasserleitungsverbindungsstück (25) nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß der Rückhaltering (32) im allgemeinen ringförmig ist.

4. Einlaßwasserleitungsverbindungsstück (25) nach einem der Ansprüche 1 bis 3, dadurch gekennzeichnet, daß die Krafterzeugungseinrichtung (20) die Größe der Druckkraft, die auf die Federelemente (66) wirkt, variieren kann.

Revendications

1. Raccord (25) pour conduite d'alimentation en eau construit pour joindre une conduite (11) d'alimentation en eau ayant un diamètre extérieur prédéterminé à l'extrémité d'une arrivée (13) de robinet à eau qui porte des filets de vis extérieurs (14) sur sa surface cylindrique extérieure et présente une région d'entrée intérieure (15) à section chanfreinée de plus grand diamètre que le diamètre extérieur prédéterminé de la conduite (11) d'alimentation en eau, dans lequel la structure du raccord comprend :
   - un premier élément (26) de corps ;
   - un second élément (28) de corps qui s'assemble au premier élément (26) de corps pour former un corps compressible (26, 28) ;
   - le corps (26, 28) ayant des première et seconde extrémités et une ouverture qui le traverse, dans laquelle première extrémité peut être engagée une conduite (11) d'alimentation en eau ayant le diamètre extérieur prédéterminé, le corps (26, 28) ayant une surface extérieure (37) à section décroissante destinée à s'ajuster dans la région d'entrée intérieure (15) à section chanfreinée de l'arrivée (13) du robinet, et à s'appuyer contre cette région, le corps (26, 28) possédant aussi un épaulement présentant la forme d'une collerette (38) dirigée vers l'extérieur, formée sur le corps (26, 28), entre la surface extérieure (37) à section décroissante et la première extrémité du corps ;
   - un ressort (30) d'un seul tenant, logé dans le corps (26, 28) ayant une série d'éléments de ressort (66) venus de matière, qui font saillie vers l'intérieur et sont inclinés vers la seconde extrémité du corps (26, 28), les éléments (66) de ressort définissant collectivement, à l'état libre, une périphérie intérieure de diamètre supérieur au diamètre extérieur prédéterminé de la conduite (11) d'alimentation en eau, les éléments (66) de ressort pouvant fléchir élastiquement mais restant dans un état libre lorsque la conduite (11) d'alimentation en eau est enfoncée à travers le corps (26, 28) ;
   - une bague de retenue (32) logée dans le corps (26, 28), positionnée entre les éléments (66) de ressort et la seconde extrémité, et normalement espacés des éléments (66) de ressort ; et
   - des moyens (26, 28) générateurs de force destinés à appliquer une force axiale initiale contre la collerette (38) dirigée vers l'extérieur du corps (26, 28) et à comprimer de cette façon les éléments du corps l'un contre l'autre et à comprimer le premier élément (26) dans la région d'entrée intérieure (15) de l'arrivée (13) du robinet, avec un ajustement à serrage entre la surface extérieure (37) à section décroissante du corps (26, 28) et la région intérieure (15) à section chanfreinée de l'arrivée (13) du robinet, en limitant le déplacement axial du corps (26, 28) vers l'arrivée (13) du robinet, les moyens (20, 28) générateurs de force comprimant la bague de retenue (32) contre le ressort (30) lors de l'application permanente d'une force, et infléchissant de cette façon les éléments (66) de ressort pour les appliquer à force contre la surface extérieure de la conduite (11) d'alimentation en eau.

2. Raccord (25) pour conduite d'alimentation en eau

selon la revendication 1, caractérisé en ce que le corps (26, 28) comprend un épaulement (42) dirigé vers l'intérieur, entre la collerette (38) dirigée vers l'extérieur et la surface extérieure (37) à section décroissante ; et

- une bague torique (34) placée dans le corps (26, 28) et disposée entre l'épaulement (42) dirigé vers l'intérieur et le premier élément (32), la bague torique (34) étant comprimée par les forces de compression lorsque ces forces sont transmises à la bague de retenue (32) entre les surfaces opposées de l'épaulement (42) et de la bague de retenue (32) lorsque le corps (26, 28) est comprimé dans la région d'entrée intérieure (15) de l'arrivée (13) du robinet.

3. Raccord (25) pour conduite d'alimentation en eau selon la revendication 1 ou la revendication 2, caractérisé en ce que la bague de retenue (32) est de forme générale annulaire.

4. Raccord (25) pour conduite d'alimentation en eau selon une des revendications 1 à 3, caractérisé en ce que les moyens (20) générateurs de force sont aptes à faire varier l'amplitude de la force de compression qui agit sur ces éléments (66) du ressort.

FIG. 1

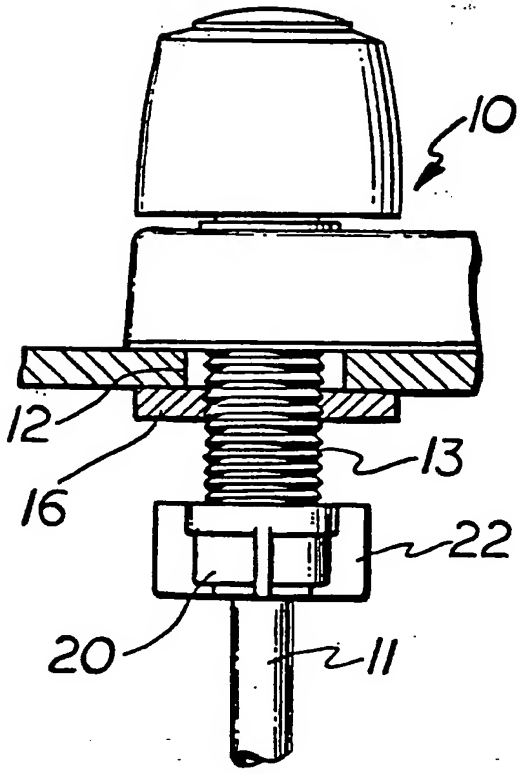
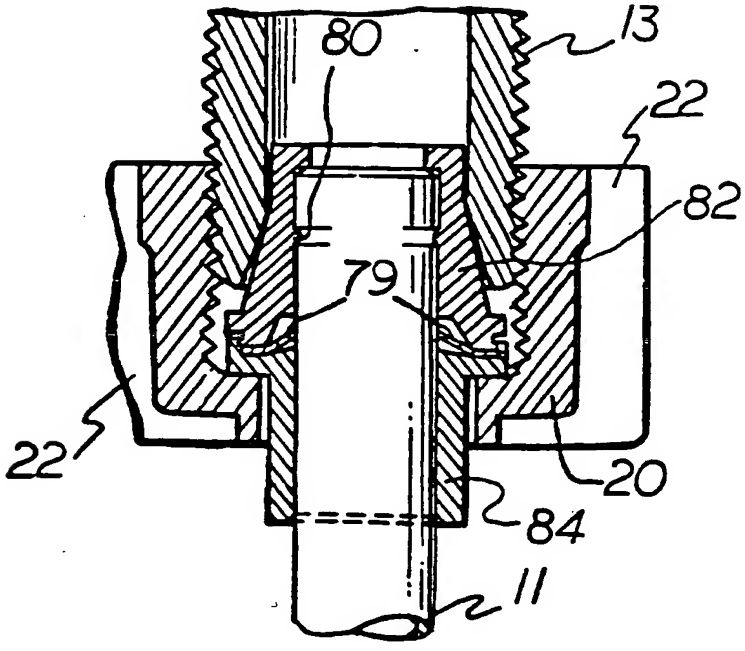
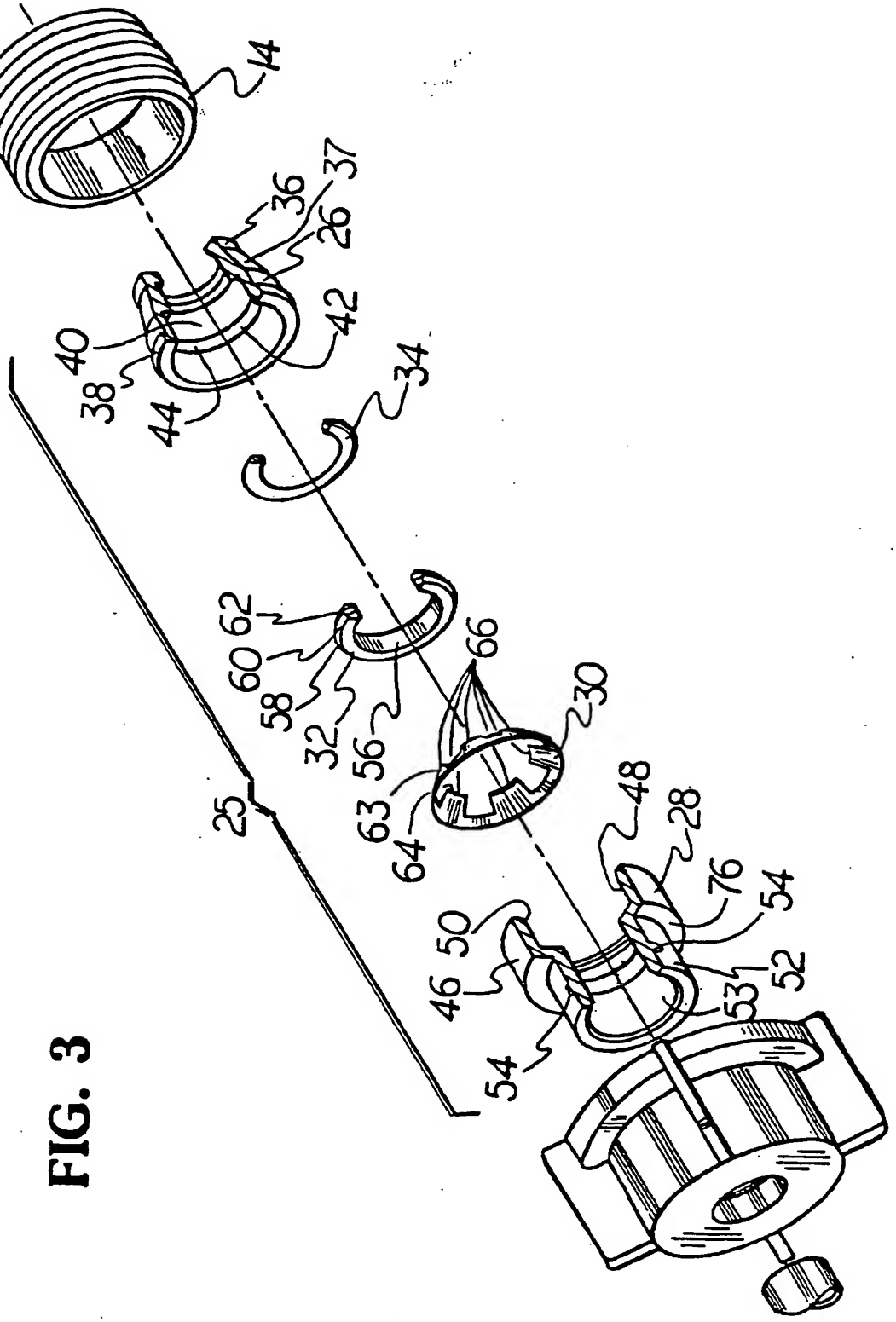


FIG. 2

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44
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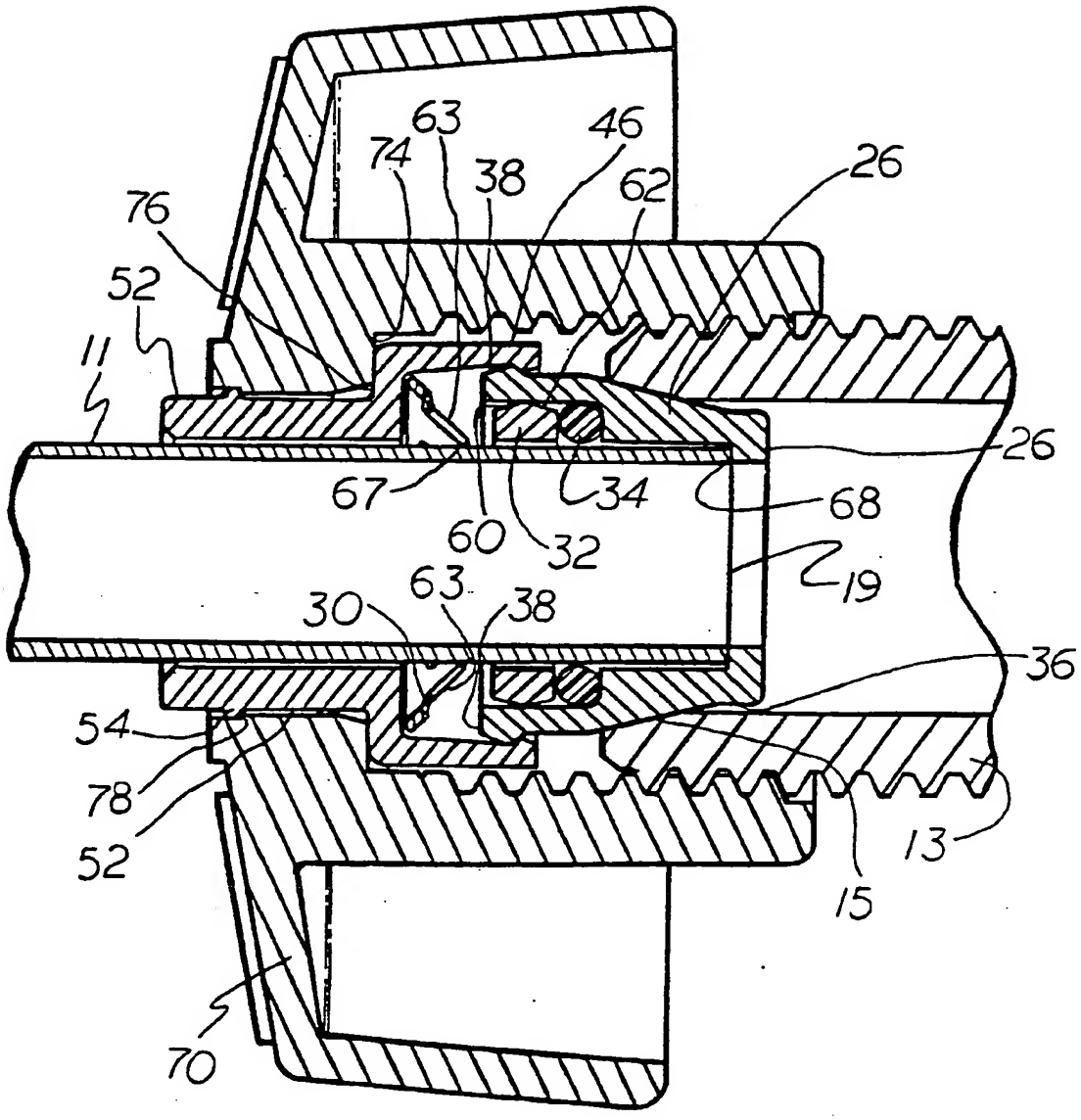
53
54

FIG. 3

FIG. 4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78
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13
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70

FIG. 5

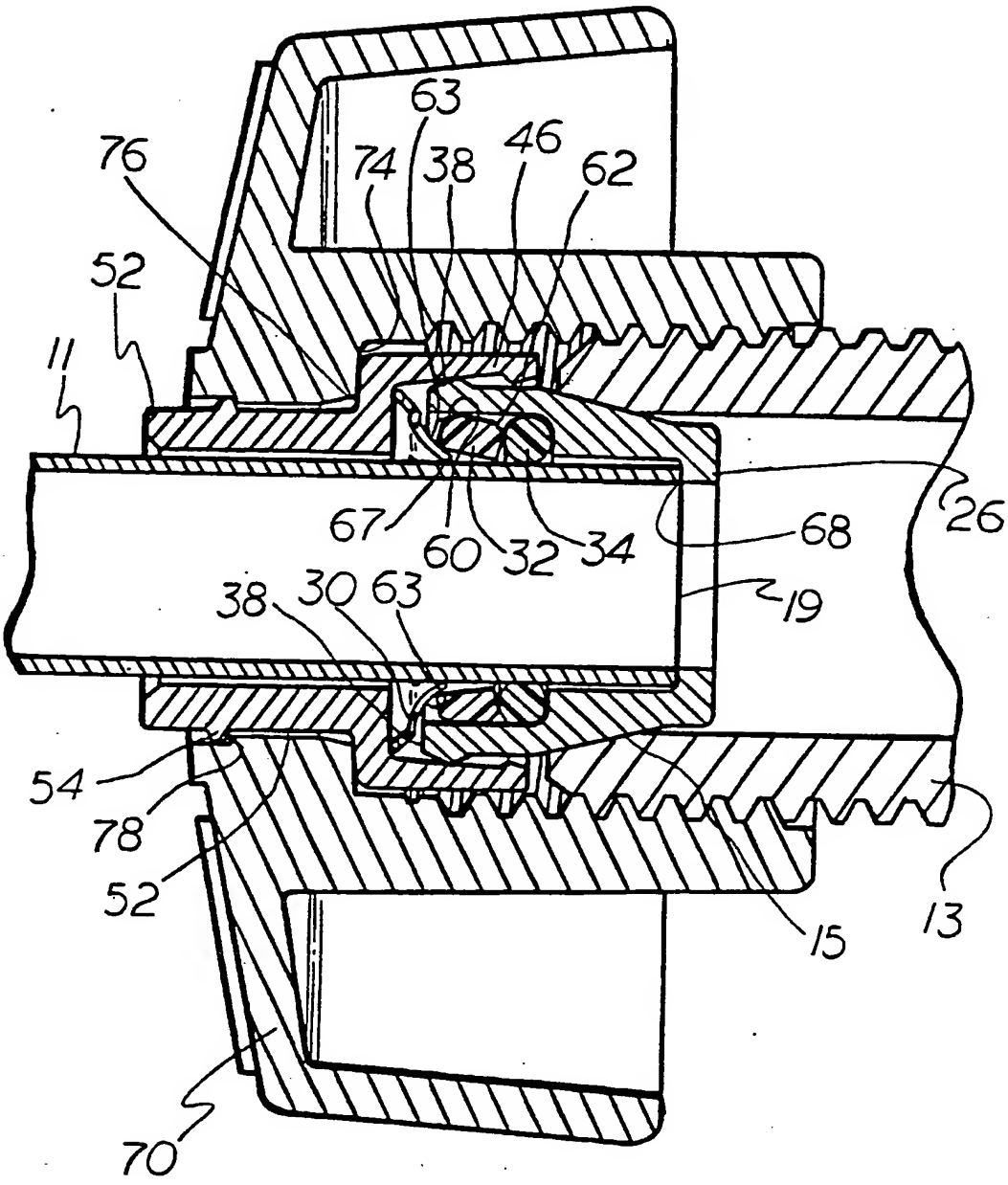

FIG. 6